



Arlington Historic District Commissions Application for Certificate

(Read attached instructions
before completing form)

For Commission Use Only:

Date Rec: _____

Hearing Date: _____

Certificate #: _____

Monitor: _____

Certificate Requested:

Appropriateness – for work described herein

Minor project Major Project Demolition

x Non-Applicability – for the following reason(s):

☒ Not subject to public view

Maintenance, repair, or replacement using same design and materials

☒ Proposed change specifically excluded from review under Bylaw

Other: _____

Hardship – financial or otherwise and does not conflict substantially with the intent and purposes of the Bylaw

General Information:

Property Address 188 Westminster Ave District Mt Gilboa/Crescent Hill

Owner(s) Ken and Brenda Kokubo Email ken@kokubo.org

Owner's Phone (h) 781-648-2786 (w) 617-733-5901 (fax) _____

Owner's Address 188 Westminster Ave

Applicant (if not Owner) _____

Applicant's Phone (h) _____ (w) _____ (fax) _____

Applicant's Address _____

Applicant's Relationship to Owner _____

Contractor Brightway Energy Phone 617-906-6655

Architect n/a Phone _____

Dates of Anticipated Work: Start 7/8/22 Completion 7/11/22

Description of Proposed Work: (attach additional pages as necessary) Please include a description of how the proposed work (if a change or addition) is historically and architecturally compatible with the building and the District as a whole.

Install low profile solar on rear roof (not visible from street or neighboring properties)

Required Documentation Acknowledgement: (see attached instructions)

☒ I acknowledge that I am required to provide supporting documentation, including the attached "Supporting Documents Checklist", by the deadlines indicated in the instructions. I understand that if such documents are not provided in a timely manner, this application will be considered to be incomplete and Commission action may be delayed.

I have read the attached instructions and, to the best of my knowledge, the information contained in this application is accurate and complete. I also give permission for members of the AHDC to access the property for the purpose of reviewing this application and work done under any certificate issued to me.

Owners Signature(s): Ken Kokubo Date: 6/9/22

Application Information and Instructions

REVIEW DESIGN GUIDELINES AND CONTACT THE COMMISSION BEFORE YOU BEGIN ANY EXTERIOR WORK WITHIN AN HISTORIC DISTRICT: Property owners in an Historic District are required to obtain a certificate from the Commission prior to starting any exterior work on buildings or structures. Applicants are encouraged to review the Commissions' Design Guidelines (available at the Commission website) prior to filing an application. Once an application is received, a formal public hearing will be scheduled to consider the application, public notice will be published, and abutters and interested parties will be notified. Please note that, by Town Bylaw, the building department cannot issue a building permit for exterior work or demolition without the necessary certificate from this Commission. Anyone contemplating exterior work should contact the Commission's Executive Secretary. Property owners are encouraged to present preliminary plans to individual Commissioners or at informal Commission hearings to better understand Commission requirements.

Types of Certificates:

Certificate of Appropriateness – Required for exterior alterations and new construction that are subject to public view unless specifically exempted by the Bylaw.

Minor Projects: doors, windows, skylights, lighting fixtures, walls, fences, HVAC and electrical equipment, gutters, and other small additions or modifications.

Major Projects: new structures, additions, projections, solar panels, and significant modifications to exterior elevations or roofs.

Demolition Projects: removal of any existing structure or portion thereof in a Historic District.

Certificate of Non-Applicability – Issued for matters that are specifically excluded from AHDC review.

Certificate of Hardship – Issued when the denial of a Certificate would constitute a hardship, financial or otherwise, on the property owner and if the proposed work does not conflict substantially with the intent and purposes of the Bylaw. Approval of a Certificate of Hardship requires detailed documentation of specific hardship to an individual property owner.

Required Documentation: At a minimum, an application for a Certificate of Appropriateness or Hardship requires the documentation specifically listed on the attached "Supporting Documentation Checklist". A Certificate of Non-Applicability requires documentation of existing conditions and proposed changes. The Commission requires one set of the documentation (preferably electronic) by the deadlines described below and seven printed sets at the hearing (3 printed sets for minor projects). A copy of the signed checklist, with the appropriate boxes checked off, must be submitted with the documentation. An application will be deemed incomplete until the required documentation has been received and reviewed by the Commission. In an emergency, required documentation can be presented at the formal hearing, however, this may delay action on the application. Based on the complexity or unique nature of a particular project, the Commission may, as allowed by law, require additional information. Failure to provide sufficient documentation could delay approval or be cause for a negative determination.

Application Deadlines: The Commission typically meets on the fourth Thursday of each month (third Thursday in November and December) at the Whittemore-Robbins House, 670R Massachusetts Avenue (behind the Robbins Library). To allow for the publishing of legally required notices prior to individual hearings, Applications must be received approximately four weeks prior to the Commission hearing date. Specific deadlines for each hearing can be obtained from the Commission's Executive Secretary. All required documentation must be provided to the Commission for its review by the following deadlines:

Minor Projects: 7 calendar days prior to scheduled hearing

Major Projects or Demolition: 14 calendar days prior to scheduled hearing

In most cases, failure to meet these deadlines will delay scheduling of a formal hearing until the following month.

Upon approval of an application at a formal hearing, a certificate will be issued approximately one week from the date of the hearing and a copy will be sent to the Building Inspector to allow issuance of a permit.

Contact Information: Additional information is available at: arlingtonhistoricdistrict.com. Inquiries, applications, and supporting documentation should be directed to Carol Greeley, Executive Secretary, ahdc@town.arlington.ma.us, (781) 316-3265, or c/o Dept of Planning and Community Development, Town Hall Annex - First Floor, 730 Massachusetts Ave., Arlington, MA 02476. Any additional questions can be addressed to the Commissions' Chair Stephen Makowka at ahdcchair@town.arlington.ma.us.

ARLINGTON HISTORIC DISTRICT APPLICATION

Supporting Documentation Checklist

Property Address 188 Westminster Ave District Mt Gilboa/Crescent Hill
 Applicant's Name Ken Kokubo Email ken@kokubo.org
 Applicant's Phone (Day) 617-733-5901 (Mobile) same

☐ **For Minor Projects or Certificate of Non-Applicability**

☐ **Drawings (11x17 max., with graphic scale, dimensioned, all materials identified) or marked up Photographs (8x10)**

Existing conditions of historic façade(s) to be modified; Show location of proposed work; Show proposed feature(s); Elevations showing proposed work and context; Drawing showing location of proposed work; Drawing showing the proposed feature(s); Site plan for site located equipment and features

Manufacturer's literature and specifications sheets describing the proposed feature(s)

☐ **Description of how the proposed work is either compatible with the District or Non-Applicable**

☒ **For Major Projects**

☒ **Photographs (8x10)**

Existing conditions of historic structure to be modified (facades, roofs, neighboring buildings); Site; Neighborhood context; Historic precedents for proposed work

☒ **Drawings (11x17 max., with graphic scale, must show differentiated existing and proposed conditions, dimensions, and all materials identified)**

○ *Plans*

Site (showing proposed structures, fences, walls, parking, HVAC equipment, electrical equipment, and relationship to adjacent roads, neighboring buildings); Each floor; Roof (showing valleys, hips, ridges, dormers, skylights, chimneys, vents, HVAC equipment, solar panels)

○ *Elevations of building facades- identify:*

Foundation; Siding ; Trim; Gutters; Downspouts; Shutters; Railings; Stairs; Windows; Doors; Roof materials; Roof pitch; Chimneys and vents; Masonry; Light fixtures; Solar panels; HVAC equipment; Electrical equipment; Fences; Signage

○ *Wall sections (especially showing projecting features such as bays, balconies, porches, additions)*

○ *Relevant exterior detail drawings (architectural trim, eaves, doors, windows, caps, columns, vents, rail systems)*

○ *Profile drawings (window and door elements, railings, balusters, stairs, shutters, roof trim, corner boards, casings, water tables, skirts, frieze boards, and all other trim)*

○ *For projections, additions and new construction also include:*

Neighborhood lot plan- include footprint to lot area ratio as well as that of neighboring lots; Plot plan- existing building(s), setbacks, proposed new structures; Site section (show relationship to site topography, adjacent structures, major landscape features, roads)

☒ **Manufacturers' literature and specification sheets describing the proposed components**

☐ **Suggested Supporting Submittals: Model; Physical Samples**

☐ **Description of how the proposed work is compatible with the District.**

☐ **For Demolition**

☐ **Statement of current state of existing structure and reason for demolition**

☐ **Statement of the historic significance of the structure**

☐ **Site Documentation (including Plot plan; Photographs of existing conditions; List existing materials; Year built; Original architect)**

☐ **Other provided documentation not described above (please list on a separate attached sheet).**

Applicants Signature(s): Ken Kokubo Date: 6/9/22

KEN KOKUBO

NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM

DC SYSTEM SIZE (7.2 KW)

GENERAL NOTES

SCOPE OF WORK

1. THE PROJECT IS NEW PHOTOVOLTAIC SYSTEM CONSISTING OF SOLAR ARRAY(S) AND ASSOCIATED POWER CONDITIONING EQUIPMENT.

2. ALL CONSTRUCTION SHALL COMPLY WITH THE ADOPTED EDITION OF THE INTERNATIONAL BUILDING CODE AND ELECTRIC CODE AS SPECIFIED IN THE PROJECT SPECIFIC NOTES.

3. IT SHALL ALSO COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE AND LOCAL ELECTRICAL UTILITY CODES, RULES AND REGULATIONS.

4. THE SYSTEM WILL BE INTERCONNECTED TO THE ELECTRICAL UTILITY GRID IN ACCORDANCE WITH THE REQUIREMENTS OF THE ADOPTED ELECTRIC AND THE ELECTRICAL UTILITY COMPANY.

5. THE CONTRACTOR SHALL PROVIDE LABOR FOR CONSTRUCTION OF THE ARRAY AND INSTALLATION OF ALL ELECTRICAL EQUIPMENT. THE CONTRACTOR WILL PROVIDE COMPETENT SUPERVISION FOR THE WORK TO BE ACCOMPLISHED. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL BY OWNER AS REQUESTED.

6. THERE WILL BE NO SUBMISSION FOR ANY EQUIPMENT WITH THE VENDOR PART NUMBER ON THE DRAWING WITHOUT WRITTEN APPROVAL OF THE PROFESSIONAL ENGINEER. COMMON ITEMS SUCH AS CONDUITS, WIRE, FITTINGS, ETC. ARE NOT SPECIFIED BY VENDOR BUT THE SIZES CANNOT BE REDUCED.

7. THE CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS AGREE THAT IN ACCORDANCE WITH THE GENERALLY ACCEPTED CONSTRUCTION PRACTICES CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE SAFETY OF ALL PERSON AND PROPERTY, AND THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND IS NOT LIMITED TO NORMAL WORKING HOURS.

8. CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS FURTHER AGREE TO DEFEND, INDEMNIFY AND HOLD HARMLESS THE DESIGN PROFESSIONAL FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE DESIGN PERSONNEL.

9. CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS WILL BE REQUIRE TO REPAIR ANY DAMAGE DONE TO BUILDINGS, GROUNDS OR UTILITIES AT NO ADDITIONAL COST TO THE CUSTOMER. DEFECTIVE MATERIAL OR WORKMANSHIP WILL NOT BE ALLOWED ON THIS PROJECT.RESONABLE HOUSEKEEPING AND CLEAN UP SHALL BE CONDUCTED BOTH DURING THE EXECUTION OF AND AT THE CONCLUSION OF THE PROJECT.

GENERAL

1. THE ACTUAL SYSTEM EQUIPMENT SPECIFICATIONS FOR THE PHOTOVOLTAIC SYSTEM ARE INCLUDED IN THE PV SYSTEM SPECIFICATION ON THE TITLE PAGE AND THROUGHOUT THE DRAWING AS NECESSARY FOR CLARITY.IN ADDITION THE ACTUAL VENDOR SPECIFICATION DATA SHEETS WILL BE INCLUDED AS PART OF THE PERMIT SUBMITTAL.

2. ONLY NEW MATERIAL WILL BE INSTALLED AS PART OF THE PROJECT. ALL NEW INSTALLED EQUIPMENT WILL BE APPROPRIATELY LISTED AND NEMA RATED. ALL NEW EQUIPMENT SHALL HAVE PERMANENT PLASTIC ENGRAVED IDENTIFICATION TAGS INSTALLED.

3. ALL CUTTING AND PATCHING REQUIRED FOR INSTALLATION OF NEW RACEWAYS AND EQUIPMENT SHALL BE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. ALL WORK SHALL BE PERFORMED BY TRADESMAN EXPERIENCED IN WORK REQUIRED. ALL FINISHES SHALL MATCH THE EXISTING ADJACENT FINISHES. OPENING IN FIRE RATED WALLS WILL BE PATCHED IN A MANNER MAINTAINING THE ORIGINAL FIRE AND SMOKE RATING.

4. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION, JUNCTION BOX, WIRE,CONDUIT, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.

5. CONTRACTOR SHALL COORDINATE ALL POWER OUTAGES WITH THE OWNER'S REPRESENTATIVE IN ADVANCE.

6. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF THE CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.

7. ELECTRICAL TESTING SHALL BE IN COMPLIANCE WITH NFPA 70E

CONDUIT AND WIRE

1. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. CONTRACTOR SHALL VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.

2. ALL CONDUCTORS SHALL BE INSTALLED IN A RACEWAY AS SPECIFIED IN THE DRAWINGS. THE EXCEPTION IS PV SOURCE CIRCUIT CONDUCTORS MADE OF PV WIRE CABLE. THESE CONDUCTORS MAY BE EXPOSED WITHIN THE PV ARRAY.

3. INDOOR EMT FITTINGS MAY BE COMPRESSION TYPE OR STEEL SET SCREW TYPE. OUTDOOR EMT FITTINGS MUST BE COMPRESSION RAINTIGHT TYPE.

4. A PULL ROPE SHALL BE INSTALLED IN ALL EMPTY CONDUITS.

5. CONDUCTORS MATERIAL, EITHER COPPER OR ALUMINUM IN SPECIFIED IN THE DRAWINGS. CONDUCTOR INSULATION TYPE SHALL BE THWN - 2 UNLESS OTHERWISE NOTED.

EQUIPMENT

1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE RATED FOR NEMA 3R OR GREATER. INSTALLATION OF THESE COMPONENTS MUST COMPLY WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

2. ALL RACEWAYS, CABINETS, BOXES, FIXTURES SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE IN AN APPROVED MANNER.

3. AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANEL BOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES WILL BE PROVIDED. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.

4. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY A COMPANY CONSISTENT WITH OTHER INSTALLED EQUIPMENT WHENEVER POSSIBLE. PART NUMBERS, RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS.

5. CONTRACTOR SHALL ENSURE ALL CEC AND MAINTENANCE CLEARANCE REQUIREMENTS ARE MET FOR NEW EQUIPMENT AND MAINTAINED FOR EXISTING EQUIPMENT.

6. CONTRACTOR SHALL FIELD VERIFY EQUIPMENT CLEARANCE AND PLACEMENTS WHILE COORDINATING LOCATORS WITH OTHER TRADES, CONSTRUCTION MANAGERS, AND SITE SUPERVISORS PRIOR TO PURCHASING AND INSTALLING EQUIPMENT.

7. EVERY STRUCTURE AND PORTION THEREOF, INCLUDING NONSTRUCTURAL COMPONENTS THAT ARE PERMANENTLY ATTACHED TO STRUCTURES AND THEIR SUPPORTS AND ATTACHMENTS, SHALL BE DESIGNED AND CONSTRUCTED TO RESIST THE EFFECTS OF EARTHQUAKE MOTIONS IN ACCORDANCE WITH ASCE 7, EXCLUDING CHAPTER 14 AND APPENDIX 11A. THE SEISMIC DESIGN CATEGORY FOR A STRUCTURE IS PERMITTED TO BE DETERMINED IN ACCORDANCE WITH SECTION 1613 OR ASCE 7.

8. ALL CONTROLS AND SWITCHES INTENDED TO BE USED BY THE OCCUPANT OF THE ROOM OR AREA TO CONTROL LIGHTING AND RECEPTACLE OUTLETS, APPLIANCE AND COOLING, HEATING AN D VENTILATING EQUIPMENT, SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE JUNCTION OR DEVICE BOX NOR LESS THAN 15 INCHES MEASURED TO THE BOTTOM OF THE JUNCTION OR DEVICE BOX ABOVE THE FINISHED FLOOR.

9. ALL RECEPTACLE OUTLETS ON BRANCH CIRCUITS OF 30 - AMPERES OR LESS AND COMMUNICATION SYSTEM RECEPTACLES SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING NOR LESS THAN 15 INCHES MEASURED TO THE BOTTOM OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING ABOVE FINISHED FLOOR.

GROUNDING

1. THE GROUNDING SYSTEM SHALL MEET THE REQUIREMENTS OF THE NEC AND THE LOCAL ADOPTED CODE. ALL ELECTRICAL EQUIPMENT AND RACEWAYS SHALL BE PROPERLY GROUNDED.

2. AN INSULATED EQUIPMENT GROUNDING CONDUCTOR, IN ACCORDANCE WITH NEC CODE , SHALL BE PROVIDED IN ALL CONDUITS WITH CURRENT CARRYING CONDUCTORS. ALL LUGS AND CONNECTORS SHALL BE RATED FOR THE CONDUCTOR MATERIAL AND THE CONDITIONS OF USE.

3. THE GROUNDING RESISTIVITY WILL BE TESTED AFTER INSTALLATION TO CONFIRM 5 OHM OR LESS RESISTANCE FROM RACKING TO GROUND. IF GROUND RESISTANCE IS GREATER THAN 5 OHMS ADDITIONAL GROUNDING WILL BE INSTALLED UNTIL RESISTANCE IS LESS THAN 5 OHMS.

WIRING DEVICES

1. RECEPTACLES SHALL BE AS DESIGNED ON THE DRAWINGS AND SHOULD BE A BRAND CONSISTENT WITH OTHERS IN THE VICINITY WHENEVER POSSIBLE.

2. ALL WIRING DEVICES SHALL BE PROVIDED WITH APPROPRIATE COVER-PLATES. ANY EMPTY BOXES SHALL HAVE BLANK COVER PLATES. COVER-PLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVER-PLATES MAY BE USED IN EQUIPMENT ROOMS.

LABELING AND PHASING

1. FOR LABELING USE NUMBERED UV RATED LABELS TO INDICATE STRING NUMBER.

2. AS A SUBSTITUTE FOR LABELS YELLOW TAPE MAY BE USED FOR PHASING

3. EACH METHOD DESCRIBED ABOVE WILL NEED TO BE PERFORMED ON BOTH POSITIVE AND NEGATIVE AT POINTS WHERE CONDUCTORS ARE TERMINATED

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE :7.2 KW DC STC
AC RATING OF SYSTEM	5.22 KW
MAX. AC OUT. CURRENT	27.23A
NO. OF MODULES	(18) HANWHA Q.PEAK DUO BLK ML G10+ 400 (400W) SOLAR MODULES
NO. OF INVERTERS	(18) ENPHASE IQ7PLUS-72-2-US MICROINVERTERS
POINT OF CONNECTION	BACKFEED BREAKER IN THE MSP
ARRAY STRINGING	(2) BRANCH OF 09 MODULES

SITE DETAILS

ASHRAE EXTREME LOW	-17°C
ASHRAE 2% HIGH	32°C
GROUND SNOW LOAD	40 PSF
WIND SPEED	119 MPH
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	B

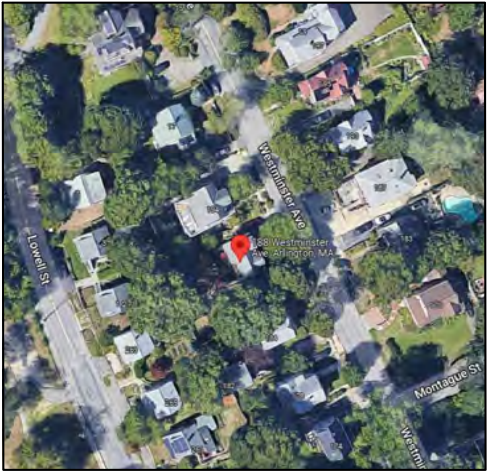
GOVERNING CODES

INTERNATIONAL FIRE CODE (IFC) , 2015
INTERNATIONAL BUILDING CODE (IBC) , 2015
INTERNATIONAL RESIDENTIAL CODE (IRC), 2015
NATIONAL ELECTRIC CODE, NEC 2014 CODE BOOK

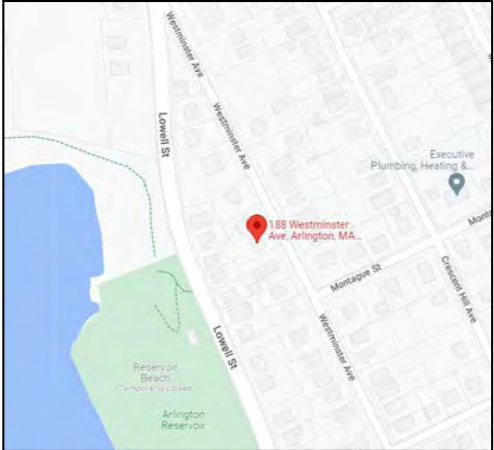
SHEET INDEX

SHEET NO.	SHEET NAME
PV-1	COVER PAGE
PV-2	SITE PLAN
PV-3	ROOF PLAN
PV-4	ARRAY LAYOUT
PV-5	STRUCTURAL DETAILS
PV-6	ELECTRICAL LINE DIAGRAM
PV-7	ELECTRICAL CALCULATIONS
PV-8	LABELS
PV-9	MODULE DATASHEET
PV-10	INVERTER DATASHEET
PV-11	COMBINER PANEL DATASHEET
PV-12	RACKING DATASHEET
PV-13	ATTACHMENT DATASHEET

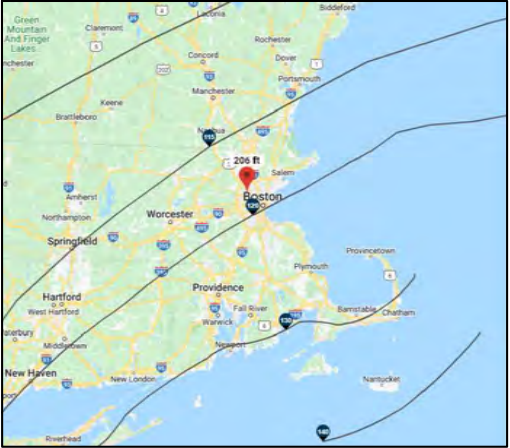
SITE MAP (N.T.S)



VICINITY MAP



WIND FLOW MAP



CONTACT: (617) 906 6655
165 MIDDLESEX AVENUE,SOMERVILLE,
MASSACHUSETTS 02145, USA

KEN KOKUBO

188 WESTMINSTER AVE,
ARLINGTON, MA 02471, USA

SIGNATURE WITH SEAL

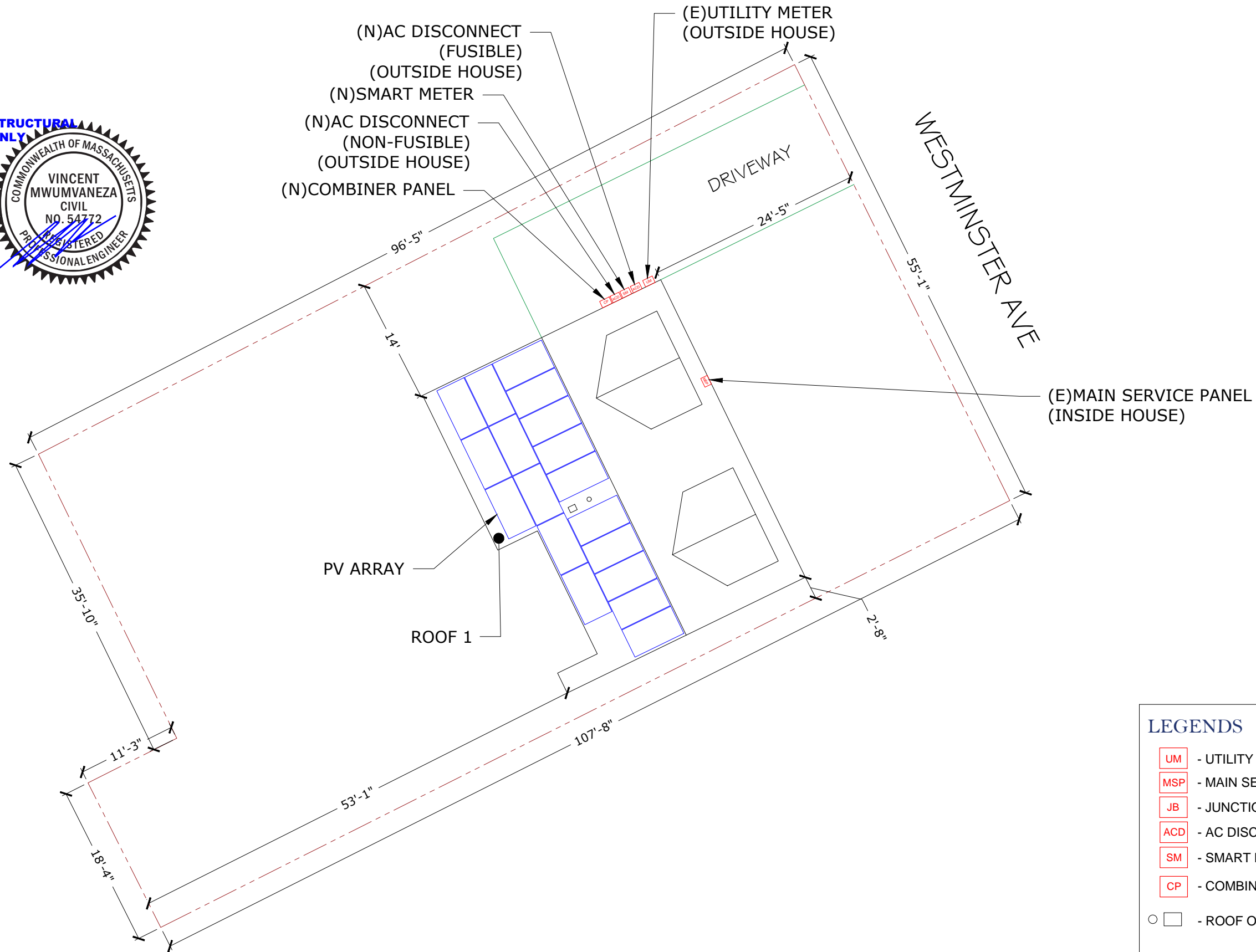
REVISIONS	DATE				
	DESCRIPTION				
	ENGG				
	REV				

PERMIT DEVELOPER

DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

COVER PAGE

PV-1



LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- SM - SMART METER
- CP - COMBINER PANEL
- □ - ROOF OBSTRUCTION


BrightWay Energy
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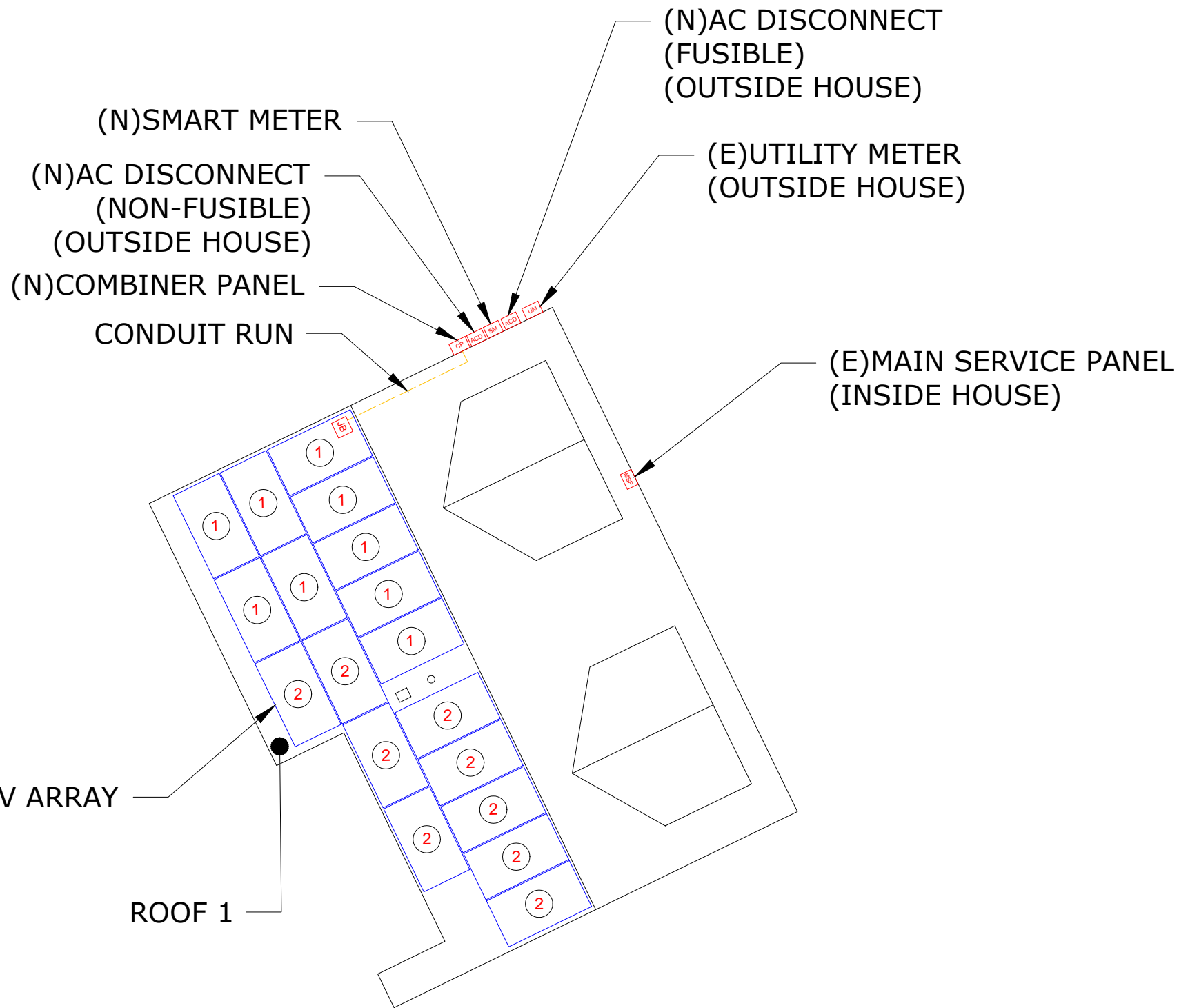
188 WESTMINSTER AVE,
ARLINGTON, MA 02471, USA

SIGNATURE WITH SEAL

REVISIONS		DATE				
		DESCRIPTION	ENG			
REV						

PERMIT DEVELOPER	
DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

SITE PLAN
PV-2



EQUIPMENT SPECIFICATIONS		
EQUIPMENT	DESCRIPTION	QUANTITY
MODULE	HANWHA Q.PEAK DUO BLK ML G10+ 400 (400W) SOLAR MODULES	18
INVERTER	ENPHASE IQ7PLUS-72-2-US MICROINVERTERS	18
JUNCTION BOX	600 V,NEMA 3R UL LISTED	1
COMBINER PANEL	125A ENPHASE IQ COMBINER 3	1
AC DISCONNECT	AC DISCONNECT 240V, 30A, NON-FUSIBLE ,NEMA 3R, UL LISTED	1
AC DISCONNECT	AC DISCONNECT 240V, 30 AMP, FUSED WITH 30A FUSES, NEMA 3R, UL LISTED	1
ATTACHMENT	SNAPNRACK (UMBRELLA FLASHING KITS)	53
RACKING	SNAPNRACK RAIL	-

ROOF SPECIFICATIONS	
ROOF MATERIAL	ASPHALT SHINGLE
ROOF CONDITION	NEW
RAFTERS	2"X10"@16" O.C.

ROOF INFORMATION			
ROOF	QUANTITY	PITCH	AZIMUTH
ROOF 1	18	20	245°

SYSTEM INFORMATION	
DC SYSTEM SIZE	7.2 KW
AC SYSTEM SIZE	5.22 KW

LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- SM - SMART METER
- CP - COMBINER PANEL
- 1 - STRING TAG
- CONDUIT RUN
- ROOF OBSTRUCTION



BrightWay Energy

CONTACT: (617) 906 6655
165 MIDDLESEX AVENUE, SOMERVILLE,
MASSACHUSETTS 02145, USA

KEN KOKUBO

188 WESTMINSTER AVE,
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SIGNATURE WITH SEAL

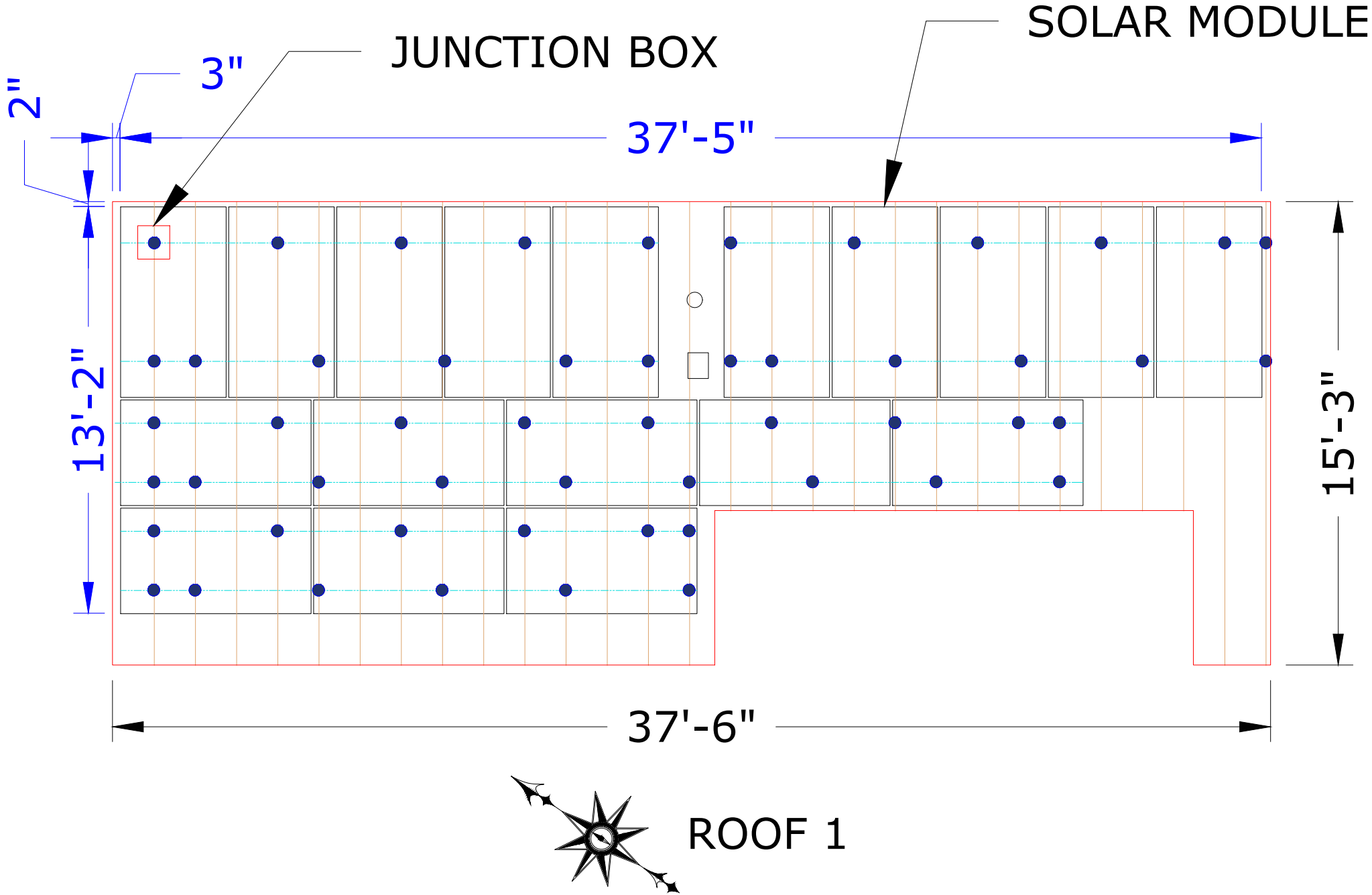
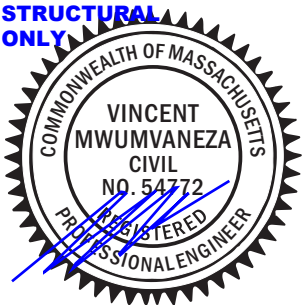
REVISIONS	DATE				
	DESCRIPTION				
	ENGG				
	REV				

PERMIT DEVELOPER	
DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

ROOF PLAN

PV-3

NOTES:
TRUSSES/RAFTERS LOCATIONS ARE APPROXIMATE. ACTUAL LOCATIONS MAY DIFFER AND CONTRACTOR MAY NEED TO ADJUST MOUNT LOCATIONS. IN NO CASE SHALL THE MOUNT SPACING EXCEED "MAX. MOUNT SPACING"



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ROOF CONDITION	NEW
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ROOF INFORMATION			
ROOF	QUANTITY	PITCH	AZIMUTH
ROOF 1	18	20	245°

SYSTEM INFORMATION	
DC SYSTEM SIZE	7.2 KW
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LEGENDS

- JUNCTION BOX
- PV ROOF ATTACHMENT
- PV ROOF ATTACHMENT
- TRUSSES/RAFTERS
- RAIL
- ROOF OBSTRUCTION

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KEN KOKUBO

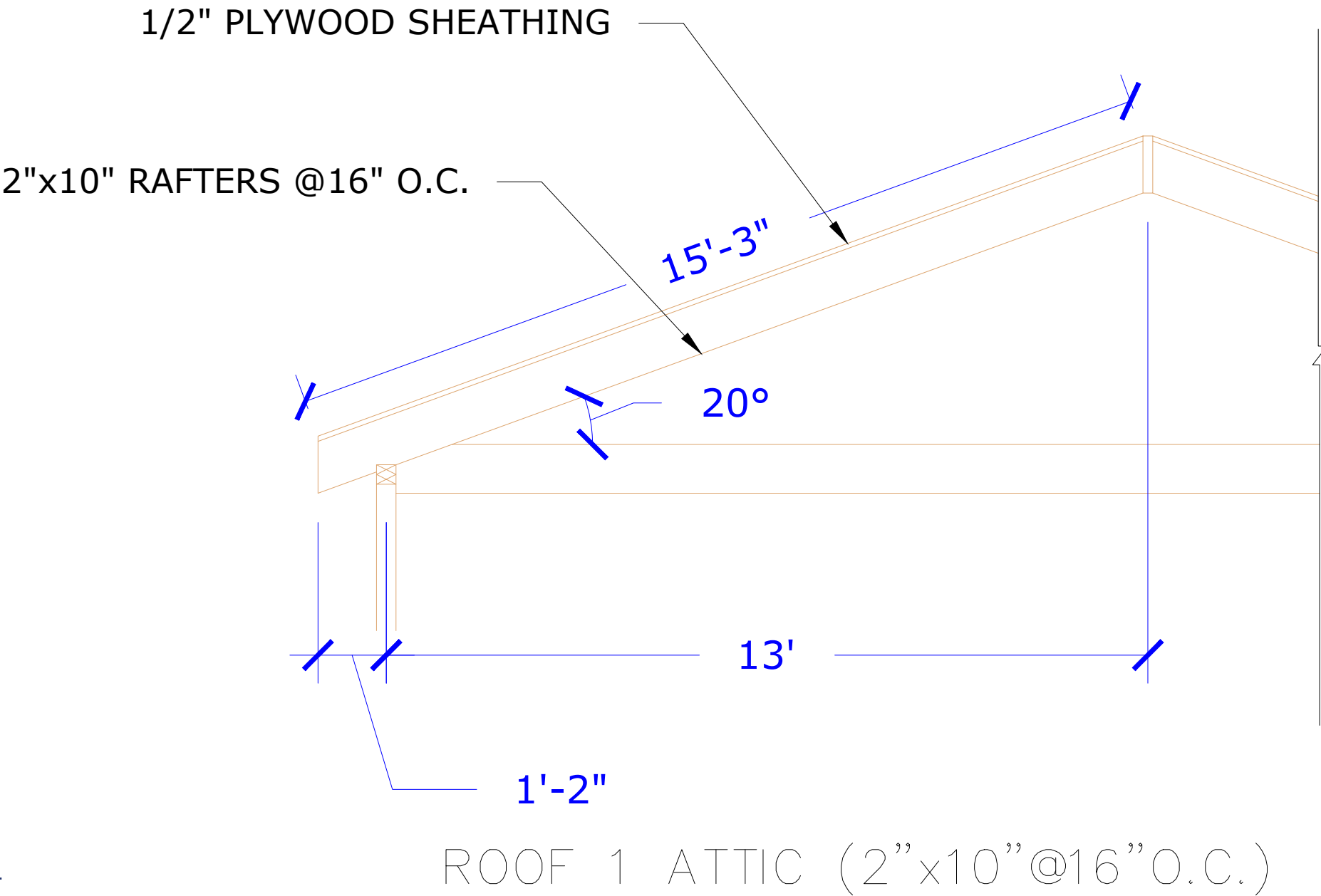
188 WESTMINSTER AVE,
ARLINGTON, MA 02471, USA

SIGNATURE WITH SEAL

REV	ENG	DESCRIPTION	DATE				

PERMIT DEVELOPER	
DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

ARRAY LAYOUT
PV-4



MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 18 MODULES
MODULE TYPE = HANWHA Q.PEAK DUO BLK ML G10+ 400 (400W)SOLAR MODULE
WEIGHT = 48.5 LBS / 22.0 KG.
MODULE DIMENSIONS = 74.0" X 41.1" = 21.12 SF

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CONTACT: (617) 906 6655
165 MIDDLESEX AVENUE,SOMERVILLE,
MASSACHUSETTS 02145, USA

KEN KOKUBO

188 WESTMINSTER AVE,
ARLINGTON, MA 02471, USA

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REV	ENG	DESCRIPTION	DATE				

PERMIT DEVELOPER	
DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

STRUCTURAL DETAILS

PV-5

CONDUIT SCHEDULE

SR. NO.	DESCRIPTION	CONDUIT SIZE
A	ENPHASE Q CABLES, (1) #10 AWG THWN-2 (G)	
1	(2) #10 AWG THWN-2 (L1) ,(2) #10 AWG THWN-2 (L2) ,(1) #10 AWG THWN-2 (G)	IN 3/4" CONDUIT RUN
2	(3) #10 AWG THWN-2 (L1,L2,N) , (1) #10 AWG THWN-2 (G)	IN 3/4" CONDUIT RUN
3	(3) #10 AWG THWN-2 (L1,L2,N) , (1) #10 AWG THWN-2 (G)	IN 3/4" CONDUIT RUN
4	(3) #10 AWG THWN-2 (L1,L2,N) , (1) #10 AWG THWN-2 (G)	IN 3/4" CONDUIT RUN

NOTE:
CONDUIT RUN - EMT, PVC, IMC, RMC, FMC, LFMC OR EQUIVALENT AS PER NEC

MODULE SPECIFICATION	
MODEL NO.	HANWHA Q.PEAK DUO BLK ML G10+ 400
PEAK POWER (Pmpp)	400W
PEAK VOLTAGE (Vmpp)	37.13V
PEAK CURRENT (Impp)	10.77A
OPEN CIRCUIT VOLTAGE (Voc)	45.30V
SHORT CIRCUIT CURRENT (Isc)	11.14A

INVERTER SPECIFICATION	
MANUFACTURER	ENPHASE
MODEL NO.	IQ7PLUS-72-2-US
MAX. DC INPUT VOLTAGE	60V
MAX. CONT. OUTPUT POWER	290VA
NOMINAL AC OUTPUT VOLTAGE	240V
MAX. CONT. OUTPUT CURRENT	1.21A

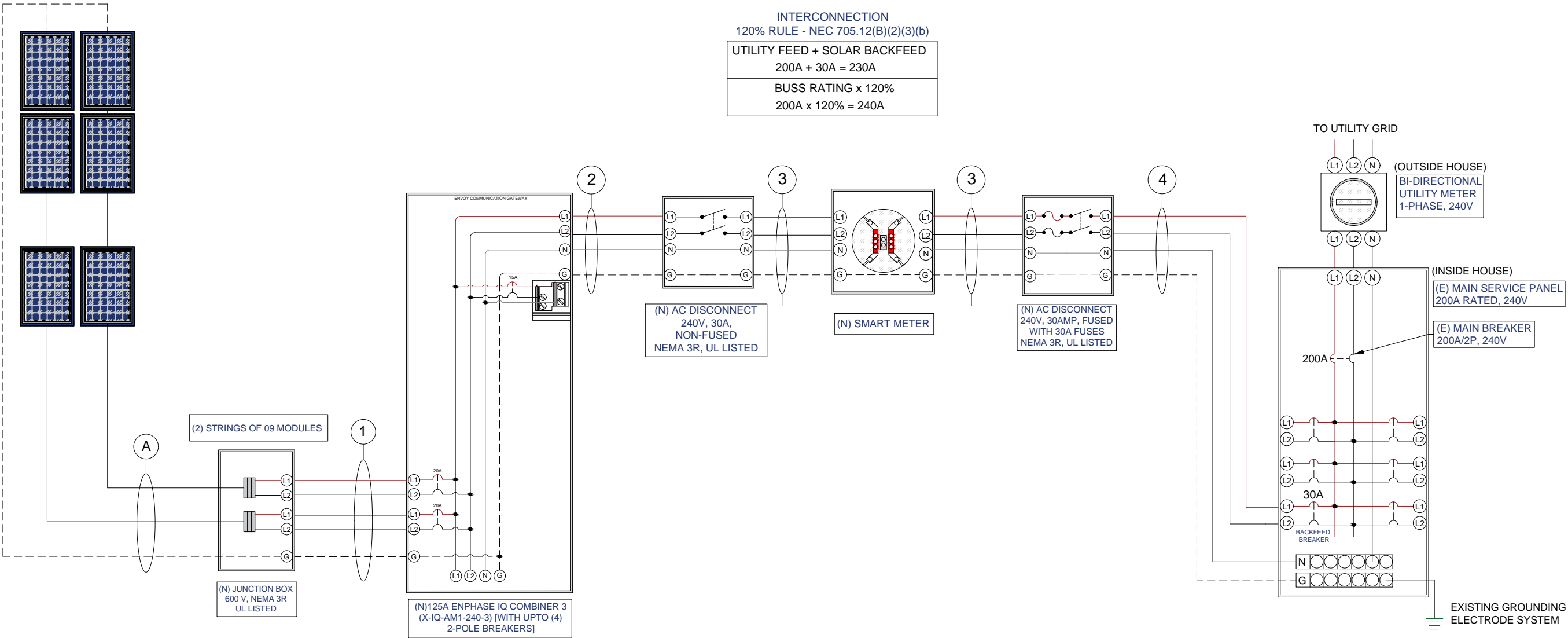
ARRAY DETAILS	
DC SYSTEM SIZE	7.2 KW
AC SYSTEM SIZE	5.22 KW
TOTAL NO. OF MODULES	18
NO. OF MODULE PER STRING	2@09
NO. OF STRING	2

(18) Q.PEAK DUO BLK G6+ 340(340W) MODULES WITH
(18) ENPHASE IQ7PLUS-72-2-US MICROINVERTERS

INTERCONNECTION
120% RULE - NEC 705.12(B)(2)(3)(b)

UTILITY FEED + SOLAR BACKFEED
200A + 30A = 230A

BUSS RATING x 120%
200A x 120% = 240A



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	REV				

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REVIEWER	

ELECTRICAL
LINE DIAGRAM

PV-6

ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL :

AMBIENT TEMPERATURE - (32+22)°C= (54°C)NEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - (0.76)NEC 310.15(B)(2)(a)
GROUPING FACTOR - (0.8)NEC 310.15(B)(3)(a)

CONDUCTOR AMPACITY:

= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(09 x 1.21) x 1.25] / 0.76/ 0.8
= 22.39A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

(B) AFTER IQ COMBINER PANEL:

TEMPERATURE DERATE FACTOR - (0.96)
GROUPING FACTOR - (1)

CONDUCTOR AMPACITY
= (TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
= [(18 x 1.21)] x 1.25 / 0.96 / 1
= 28.36 A

SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

2. PV OVER CURRENT PROTECTION ...NEC 690.9(B)

= TOTAL INVERTER O/P CURRENT x 1.25
= (18 x 1.21)x 1.25 = 27.23 A =30A

SELECTED OCPD IS 30A

GENERAL ELECTRICAL NOTES:

1. THE DC AND AC CONNECTORS OF THE ENPHASE IQ7PLUS-72-2-US ARE LISTED TO MEET REQUIREMENTS AS A DISCONNECT MEANS AS ALLOWED BY NEC 690.15(A) AND NEC 690.17(E).
2. MICROINVERTER BRANCH CIRCUIT CONDUCTORS ARE MANUFACTURED ENPHASE Q CABLES LISTED FOR USE IN 20A OR LESS CIRCUITS OF ENPHASE IQ MICROINVERTERS. THEY ARE ROHS, OIL RESISTANT, AND UV RESISTANT. THEY CONTAIN AWG CONDUCTORS OF TYPE THHN/THWN-2 DRY/WET AND CERTIFIED TO UL3003 AND UL 9703. THE CABLE'S DOUBLE INSULATED RATING REQUIRES NO NEUTRAL OR GROUNDED CONDUCTOR.
3. UNGROUNDED SYSTEM DC CONDUCTORS SHALL BE COLOR-CODED AS FOLLOWS. DC POSITIVE SHALL BE RED (OR MARKED RED) AND DC NEGATIVE SHALL BE BLACK (OR MARKED BLACK)
4. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NONCURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(B) AND PART III OF NEC ARTICLE 250 AND EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45. THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO 690.47(B) AND 250.169. THE DC GROUNDING ELECTRODE SHALL BE SIZED ACCORDING TO 250.166
5. AN ADDITIONAL ARRAY GROUNDING ELECTRODE SHALL BE INSTALLED IN ACCORDANCE WITH NEC SECTIONS 250.52 AND 250.54 UNLESS THE ARRAY STRUCTURE IS SUITABLE TO SERVE AS A GROUNDING ELECTRODE AS PER NEC SECTION 250.2, THE LOAD SERVED BY THE ARRAY IS INTEGRAL WITH THE ARRAY, OR THE PREMISE'S EXISTING WIRING ELECTRODE IS LOCATED WITHIN 6FT, AS PER NEC SECTION 690.47(D)
6. PV SYSTEM DISCONNECT SHALL BE A VISIBLE KNIFE-BLADE TYPE DISCONNECT THAT IS ACCESSIBLE AND LOCKABLE BY THE UTILITY. THE DISCONNECT SHALL BE LOCATED WITHIN 10 FT OF UTILITY METER.
7. POINT-OF-CONNECTION IS ON THE SUPPLY SIDE OF SERVICE DISCONNECT, INSIDE PANELBOARD ENCLOSURE USING UNUSED TERMINALS, TERMINALS THAT ARE SUITABLE FOR DOUBLE LUGGING, OR USING OTHER LOCALLY-APPROVED METHODS AND HARDWARE, IN COMPLIANCE WITH NEC 705.12(A).
8. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
9. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
10. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.8 (D).
11. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.8 (C).

GROUNDING NOTES:

PV MODULE AND RACKING GROUNDING AS PER APPROVED INSTALLATION PRACTICE AND IN LINE WITH MANUFACTURE'S GUIDELINES.



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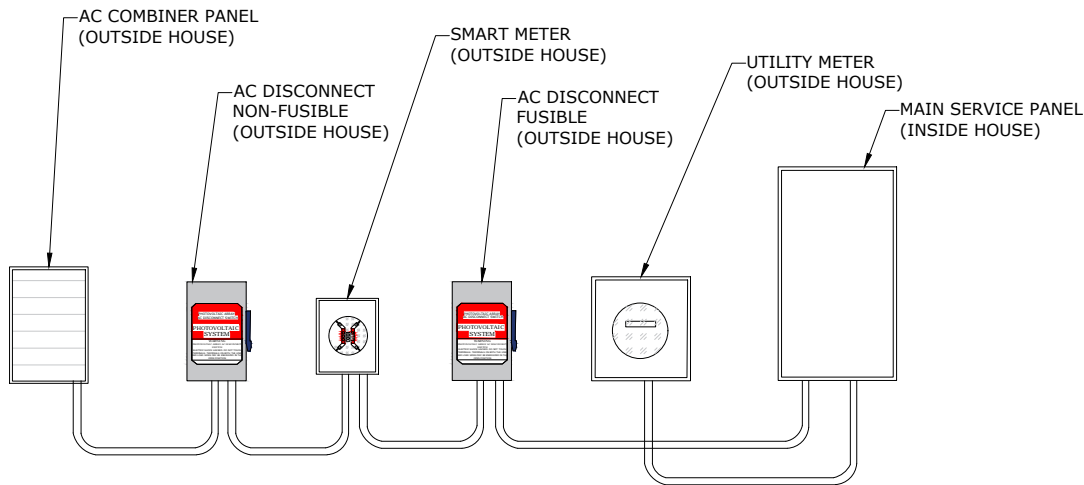
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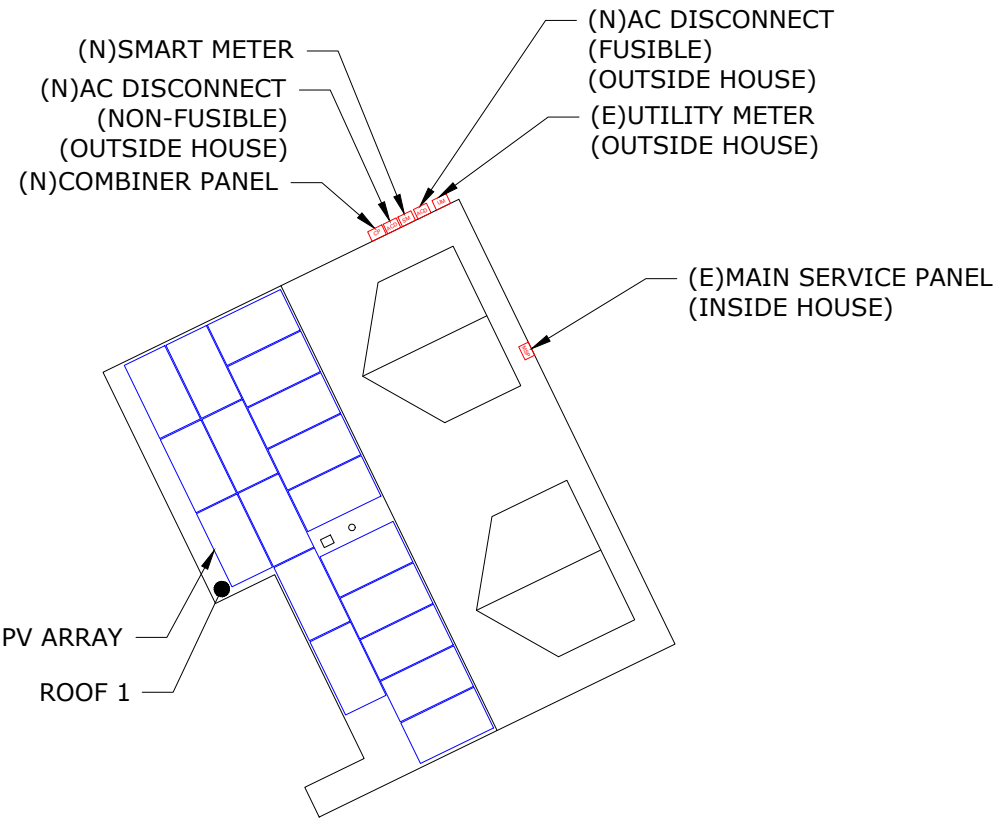
ELECTRICAL CALCULATIONS
PV-7

EQUIPMENT ELEVATION VIEW



WARNING ⚠

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN



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BrightWay
Energy

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SOLAR DC DISCONNECT & INVERTER LABELS

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD
SIDES MAY BE ENERGIZED IN THE OPEN
POSITION

WARNING
ELECTRIC SHOCK HAZARD
NO USER SERVICEABLE PARTS INSIDE
CONTACT AUTHORIZED SERVICE PROVIDE
FOR ASSISTANCE

WARNING
AC VOLTAGE = 240V
MAX FUSE: 30A
MAX CURRENT: 27.23A

WARNING
ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS
PHOTOVOLTAIC SYSTEM ARE
UNGROUND AND MAY BE ENERGIZED

**PHOTOVOLTAIC SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN**

EMERGENCY CONTACT
617-906-6655

AC COMBINER PANEL LABELS

**SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN
SWITCH TO THE
"OFF" POSITION TO
SHUTDOWN PV SYSTEM
AND REDUCE
SHOCK HAZARD
IN ARRAY

CONDUIT LABELS

CAUTION
PHOTOVOLTAIC AC SOURCE

UTILITY METER

WARNING
⚠ DUAL POWER SOURCE ⚠

NOTICE
THIS SYSTEM IS EQUIPPED WITH RAPID
SHUTDOWN ROOFTOP INVERTERS WILL
DE-ENERGISE AT SERVICE PANEL OUTAGE

NOTICE
AC COMBINER AND DATA ACQUISITION.
DO NOT ADD LOADS.
DO NOT TOUCH TERMINALS.
LINE AND LOAD SIDE MAY BE ENERGIZED
IN OPEN POSITION.

SERVICE PANEL LABEL

WARNING
THIS IS MAIN 1 OF 2 WITH
MAIN 2 OF 2 LOCATED OUTSIDE
THIS SERVICE IS ALSO SERVED BY A PV SYSTEM WITH
RAPID SHUTDOWN. INVERTERS LOCATED ON ROOF
AUTO DE-ENERGISE WHEN SOLAR SERVICE MAIN IS
IN OPEN POSITION.
THE DC CONDUCTORS OF THE PV SYSTEM ARE
UNGROUND AND MAY BE ENERGIZED.
IF BACKFEED BREAKER PRESENT DO NOT RELOCATE
THIS OVERCURRENT DEVICE.

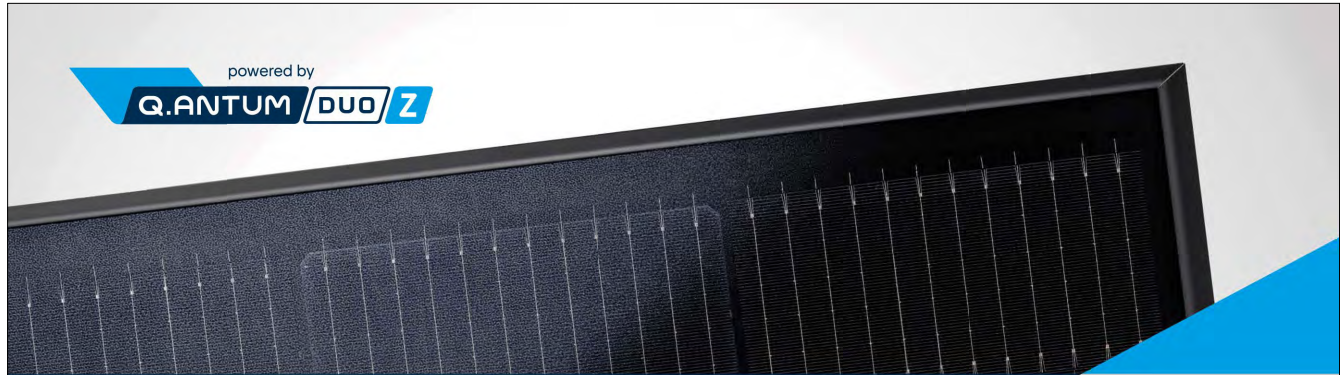
CAUTION
DO NOT DISCONNECT
UNDER LOAD

LABEL
CAUTION
SOLAR CIRCUIT

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DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

LABELS
PV-8



Q.PEAK DUO BLK ML-G10+

385-405

ENDURING HIGH PERFORMANCE



BREAKING THE 20% EFFICIENCY BARRIER

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.



THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY

Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.



INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.



ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID Technology, Anti PID Technology¹, Hot-Spot Protect and Traceable Quality Tra.Q™.



EXTREME WEATHER RATING

High-tech aluminum alloy frame, certified for high snow (5400Pa) and wind loads (4000Pa).



A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty².

¹ APT test conditions according to IEC / TS 62804-1:2015, method A (-1500V, 96h)
² See data sheet on rear for further information.

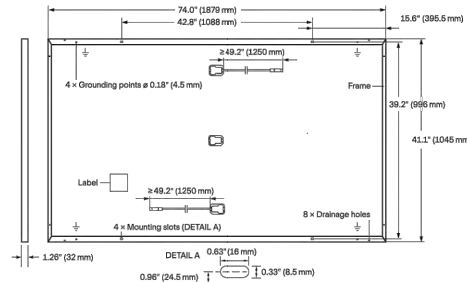
THE IDEAL SOLUTION FOR:
Rooftop arrays on residential buildings

Engineered in Germany



MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

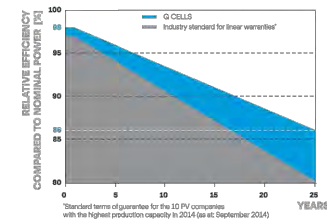


ELECTRICAL CHARACTERISTICS

POWER CLASS		385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5W / -0W)						
Minimum	Power at MPP ¹	P _{MPP} [W]	385	390	395	400
	Short Circuit Current ¹	I _{SC} [A]	11.04	11.07	11.10	11.14
	Open Circuit Voltage ¹	V _{OC} [V]	45.19	45.23	45.27	45.30
	Current at MPP	I _{MPP} [A]	10.59	10.65	10.71	10.77
	Voltage at MPP	V _{MPP} [V]	36.36	36.62	36.88	37.13
	Efficiency ¹	η [%]	≥ 19.6	≥ 19.9	≥ 20.1	≥ 20.4
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ²						
Minimum	Power at MPP	P _{MPP} [W]	288.8	292.6	296.3	300.1
	Short Circuit Current	I _{SC} [A]	8.90	8.92	8.95	8.97
	Open Circuit Voltage	V _{OC} [V]	42.62	42.65	42.69	42.72
	Current at MPP	I _{MPP} [A]	8.35	8.41	8.46	8.51
	Voltage at MPP	V _{MPP} [V]	34.59	34.81	35.03	35.25

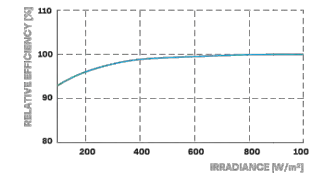
¹ Measurement tolerances P_{MPP} ± 3%; I_{SC}, V_{OC} ± 5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • ² 800 W/m², NMOT, spectrum AM 1.5

Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{SC}	α	[% / K]	+0.04	Temperature Coefficient of V _{OC}	β	[% / K]	-0.27
Temperature Coefficient of P _{MPP}	γ	[% / K]	-0.34	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V _{sys}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull ³	[lbs / ft ²]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push / Pull ³	[lbs / ft ²]	113 (5400 Pa) / 84 (4000 Pa)		

³ See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant, Quality Controlled PV - TÜV Rheinland, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells), QCPV Certification ongoing.



Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pallets	24 pallets	32 modules
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Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL Inquiry@us.q-cells.com | WEB www.q-cells.us

Specifications subject to technical changes © Q CELLS Q.PEAK DUO BLK ML-G10+ 385-405_2021-05_Rev01_NA



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MODULE DATASHEET

PV-9

Data Sheet
Enphase Microinverters
Region: AMERICAS

Enphase
IQ 7 and IQ 7+
Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.



To learn more about Enphase offerings, visit enphase.com



Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)		IQ7-60-2-US		IQ7PLUS-72-2-US	
Commonly used module pairings ¹	235 W - 350 W +		235 W - 440 W +		
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules		
Maximum input DC voltage	48 V		60 V		
Peak power tracking voltage	27 V - 37 V		27 V - 45 V		
Operating range	16 V - 48 V		16 V - 60 V		
Min/Max start voltage	22 V / 48 V		22 V / 60 V		
Max DC short circuit current (module Isc)	15 A		15 A		
Overvoltage class DC port	II		II		
DC port backfeed current	0 A		0 A		
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit				
OUTPUT DATA (AC)		IQ 7 Microinverter		IQ 7+ Microinverter	
Peak output power	250 VA		295 VA		
Maximum continuous output power	240 VA		290 VA		
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V	
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)	
Nominal frequency	60 Hz		60 Hz		
Extended frequency range	47 - 68 Hz		47 - 68 Hz		
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms		
Maximum units per 20 A (L-L) branch circuit ³	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)	
Overvoltage class AC port	III		III		
AC port backfeed current	18 mA		18 mA		
Power factor setting	1.0		1.0		
Power factor (adjustable)	0.85 leading ... 0.85 lagging		0.85 leading ... 0.85 lagging		
EFFICIENCY	@240 V	@208 V	@240 V	@208 V	
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %	
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %	
MECHANICAL DATA					
Ambient temperature range	-40°C to +65°C				
Relative humidity range	4% to 100% (condensing)				
Connector type	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)				
Dimensions (HxWxD)	212 mm x 175 mm x 30.2 mm (without bracket)				
Weight	1.08 kg (2.38 lbs)				
Cooling	Natural convection - No fans				
Approved for wet locations	Yes				
Pollution degree	PD3				
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure				
Environmental category / UV exposure rating	NEMA Type 6 / outdoor				
FEATURES					
Communication	Power Line Communication (PLC)				
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.				
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.				
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.				

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit enphase.com

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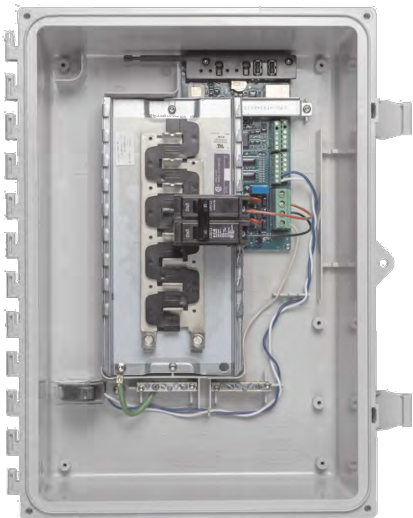
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INVERTER DATASHEET

PV-10

Enphase
IQ Combiner 3
(X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3™** with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

Simple

- Reduced size from previous combiner
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G/12-year data plan) CELLMODEM-01 (3G/5-year data plan) CELLMODEM-M1 (4G based LTE-M/5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
* Consumption monitoring is required for Enphase Storage Systems	
Wireless USB adapter COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows redundant wireless communication with Encharge and Enpower.
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80A of distributed generation / 90A with IQ Envoy breaker included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included)
COMPLIANCE	
Compliance, Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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2019-11-04



CONTACT: (617) 906 6655
165 MIDDLESEX AVENUE,SOMERVILLE,
MASSACHUSETTS 02145, USA

KEN KOKUBO

188 WESTMINSTER AVE,
ARLINGTON, MA 02471, USA

SIGNATURE WITH SEAL

REVISIONS	DATE				
	DESCRIPTION				
	ENG				
	REV				

PERMIT DEVELOPER

DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

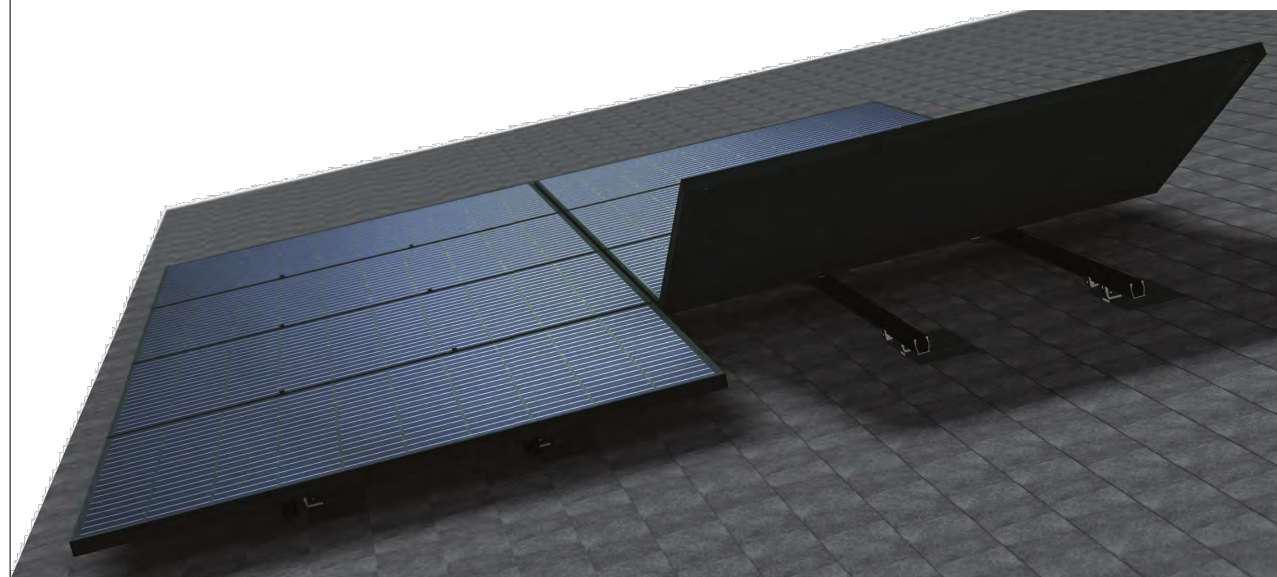
COMBINER PANEL
DATASHEET

PV-11



Ultra Rail

Ultra Rail



The Ultimate Value in Rooftop Solar



Industry leading Wire Management Solutions



Mounts available for all roof types



An install experience unlike any other



Compatible with all Series 100 Module Clamps & Accessories

Start Installing Ultra Rail Today

RESOURCES
DESIGN
WHERE TO BUY

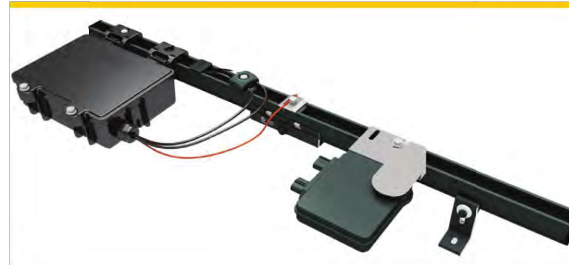
snapnrack.com/resources
snapnrack.com/configurator
snapnrack.com/where-to-buy

The SnapNrack Ultra Rail

is a sleek, lightweight rail solution for mounting solar modules on the roof.

The Entire System is a Snap to Install

- New Ultra Rail Mounts include snap-in brackets for attaching rail
- Compatible with all the SnapNrack Mid Clamps and End Clamps customers love
- Universal End Clamps and snap-in End Caps provide a clean look to the array edge



Unparalleled Wire Management

- Open rail channel provides room for running wires resulting in a long-lasting quality install
- Industry best wire management offering includes Junction Boxes, Universal Wire Clamps, MLPE Attachment Kits, and Conduit Clamps
- System is fully bonded and listed to UL 2703 Standard

The Largest Span Capabilities of any Light Rail Solution

This table was prepared in compliance with applicable engineering codes and standards. Values are based on the following:

- ASCE 7-10
- Chapter 30 Wind Loads & Chapter 7 Snow Loads
- Roof Slope: 7 - 27 deg
- Roof Height: 0 - 30 ft
- Exposure: B
- Roof Zone: 1
- Module Orientation: Portrait
- Roof Type: Comp

Visit SnapNrack.com for detailed span tables and certifications.

System Span Key	
6 ft Spans	
4 ft Spans	
2 ft Spans	

		Ultra Rail, UR-40 Rail System Spans																
		Wind (mph)																
Snow (psf)	0																	
	5																	
	10																	
	15																	
	20																	
	25																	
	30																	
	35																	
	40																	
	45																	
	50																	
	60																	
	70																	
	80																	
	90																	
	100																	
	110																	
	120																	

Quality. Innovative. Superior.

SnapNrack Solar Mounting Solutions are engineered to optimize material use and labor resources and improve overall installation quality and safety.

877-732-2860

www.snapnrack.com

contact@snapnrack.com

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REVISIONS	DATE				
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	ENG				
	REV				

PERMIT DEVELOPER

DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

RACKING
DATASHEET

PV-12

DESCRIPTION:
SNAPNRACK, ULTRA RAIL COMP KIT

PART NUMBER(S):
SEE BELOW

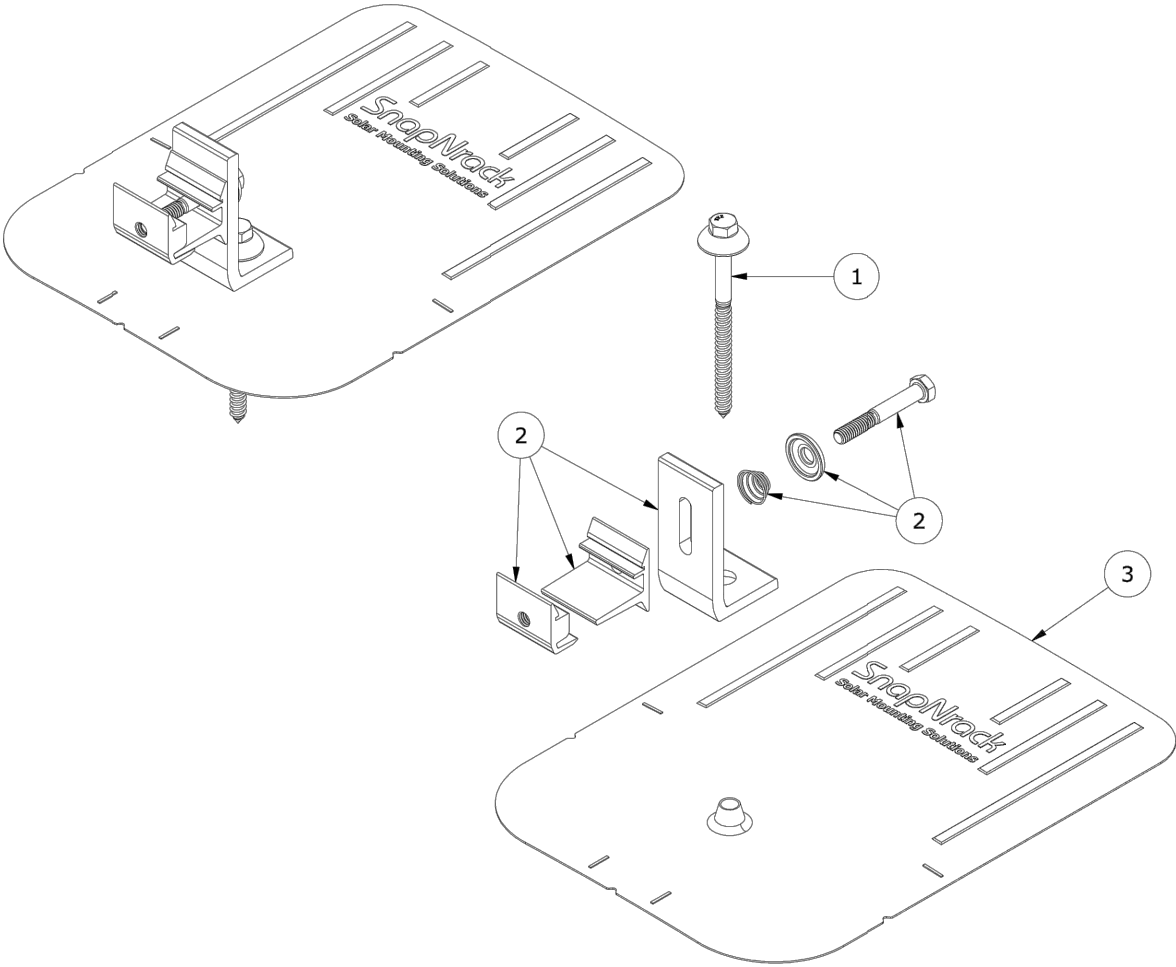
DRAWN BY:
mwatkins

REVISION:
B

SnapNrack™
Solar Mounting Solutions

595 MARKET STREET, 29TH FLOOR • SAN FRANCISCO, CA. 94105 USA
PHONE (415) 580-6900 • FAX (415) 580-6902

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WRITTEN CONSENT OF SUNRUN SOUTH LLC.



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	242-92266	SNAPNRACK, UMBRELLA LAG, TYPE 3, 4IN, SS
2	1	242-01219, 242-01220	SNAPNRACK, ULTRA FOOT FOR U FLASHING, SILVER / BLACK
3	1	232-01375, 232-01376	SNAPNRACK, COMP FLASHING, 9IN X 12IN, SILVER / BLACK ALUM

MATERIALS:	6000 SERIES ALUMINUM, STAINLESS STEEL, RUBBER
DESIGN LOAD (LBS):	405 UP, 788 DOWN, 236 SIDE
ULTIMATE LOAD (LBS):	2006 UP, 4000 DOWN, 1070 SIDE
TORQUE SPECIFICATION:	12 LB-FT
CERTIFICATION:	UL 2703, FILE E359313; WIND-DRIVEN RAIN TEST FROM UL SUBJECT 2582
WEIGHT (LBS):	0.80

DESCRIPTION:
SNAPNRACK, ULTRA RAIL COMP KIT

PART NUMBER(S):
SEE BELOW

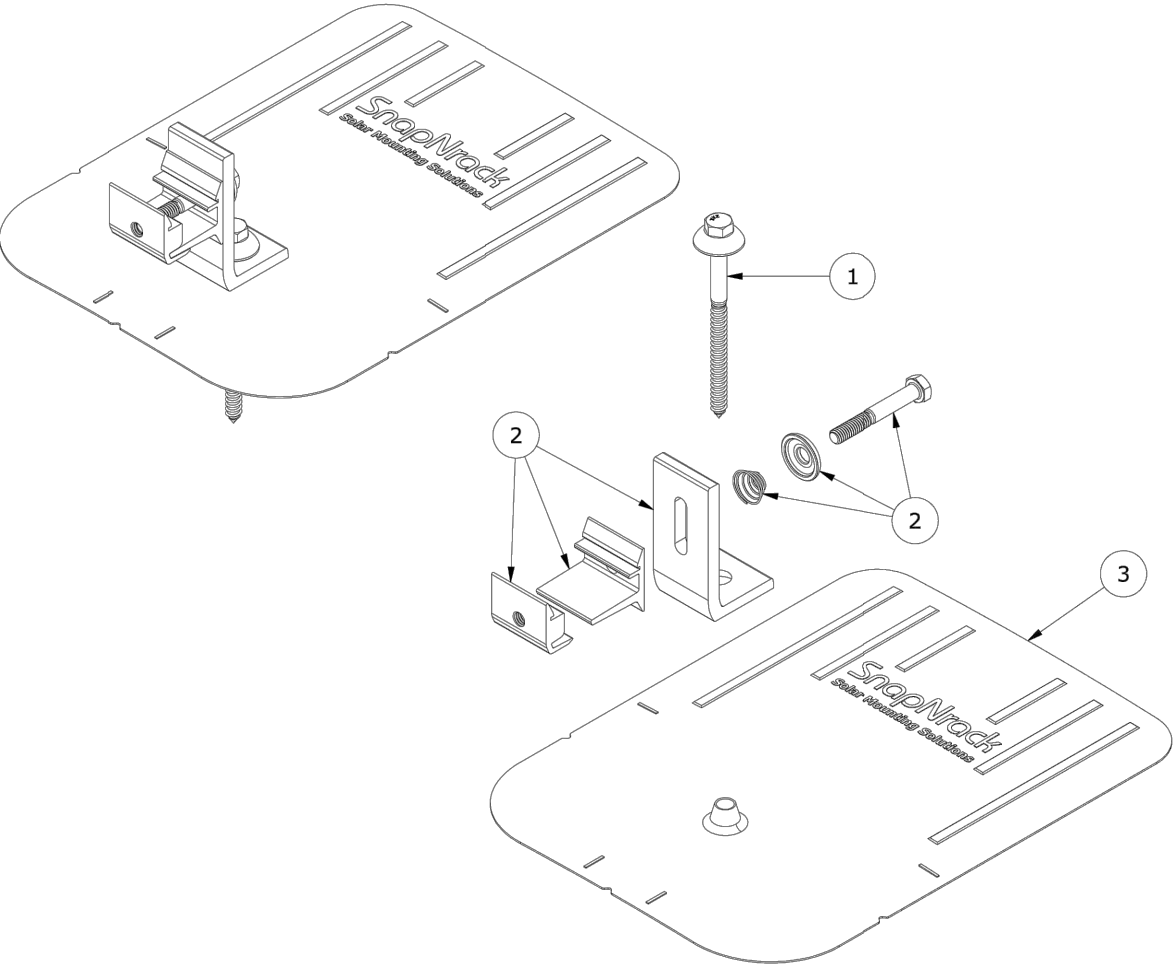
DRAWN BY:
mwatkins

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ARLINGTON, MA 02471, USA

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REVISIONS	DATE				
	DESCRIPTION				
	ENG				
	REV				

PERMIT DEVELOPER

DATE	03/25/2022
DESIGNER	OAH
REVIEWER	

ATTACHMENT
DATASHEET

PV-13

3/25/2022

RE: Structural Certification for Installation of Residential Solar
KEN KOKUBO:188 WESTMINSTER AVE, ARLINGTON, MA 02471, USA

Attn: To Whom It May Concern

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. From the field observation report, the roof is made of Asphalt Shingle roofing over roof plywood supported by 2X10 Rafters at 16 inches. The slope of the roof was approximated to be 20 degrees.

After review of the field observation data and based on our structural capacity calculation, **the existing roof framing has been determined to be adequate to support the imposed loads without structural upgrades.** Contractor shall verify that existing framing is consistent with the described above before install. Should they find any discrepancies, a written approval from SEOR is mandatory before proceeding with install. Capacity calculations were done in accordance with applicable building codes.

Design Criteria

Code	2015 IRC (ASCE 7-10)-CMR 780 9th Ed		
<u>Risk category</u>		<u>II</u>	<u>Wind Load</u> (component and Cladding)
<u>Roof Dead Load</u>	Dr	10 psf	V 119 mph
<u>PV Dead Load</u>	DPV	3 psf	Exposure B
<u>Roof Live Load</u>	Lr	20 psf	
<u>Ground Snow</u>	S	40 psf	

If you have any questions on the above, please do not hesitate to call.

Sincerely,

Vincent Mwumvaneza, P.E.
EV Engineering, LLC
projects@evengineersnet.com
<http://www.evengineersnet.com>



Structural Letter for PV Installation

3/25/2022

Job Address: 188 WESTMINSTER AVE
ARLINGTON, MA 02471, USA

Job Name: KEN KOKUBO

Job Number: 220325KK

Scope of Work

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. All PV mounting equipment shall be designed and installed per manufacturer's approved installation specifications.

Table of ContentSheet

- | | |
|---|---------------------------------|
| 1 | Cover |
| 2 | Attachment checks |
| 3 | Snow and Roof Framing Check |
| 4 | Seismic Check and Scope of work |

Engineering Calculations Summary

Code	2015 IRC (ASCE 7-10)-CMR 780 9th Ed
------	-------------------------------------

Risk category	II
---------------	----

Roof Dead Load	Dr	10 psf
----------------	----	--------

PV Dead Load	DPV	3 psf
--------------	-----	-------

Roof Live Load	Lr	20 psf
----------------	----	--------

Ground Snow	S	40 psf
-------------	---	--------

Wind Load	(component and Cladding)
-----------	--------------------------

V	119 mph
---	---------

Exposure	B
----------	---

References

NDS for Wood Construction

Sincerely,

Vincent Mwumvaneza, P.E.

EV Engineering, LLC

projects@evengineersnet.com<http://www.evengineersnet.com>

Wind Load Cont.

Risk Category =	II	ASCE 7-10 Table 1.5-1
Wind Speed (3s gust), V =	119 mph	ASCE 7-10 Figure 26.5-1A
Roughness =	B	ASCE 7-10 Sec 26.7.2
Exposure =	B	ASCE 7-10 Sec 26.7.3
Topographic Factor, K_{ZT} =	1.00	ASCE 7-10 Sec 26.8.2
Pitch =	20.0 Degrees	
Adjustment Factor, λ =	1	ASCE 7-10 Figure 30.5-1
a =	3.60 ft	ASCE 7-10 Figure 30.5-1

Where a: 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than 4% of least horizontal dimension or 3ft (0.9m)

Uplift (0.6W)	Zone 1 (psf)	Zone 2 (psf)	Zone 3 (psf)	
Pnet30=	-21.2	-29.8	-47.0	Figure 30.5-1
Pnet = $0.6 \times \lambda \times K_{ZT} \times Pnet30$ =	12.71	17.91	28.23	Equation 30.5-1
Downpressure (0.6W)	Zone 1 (psf)	Zone 2 (psf)	Zone 3 (psf)	
Pnet30=	11.4	11.4	11.4	Figure 30.5-1
Pnet = $0.6 \times \lambda \times K_{ZT} \times Pnet30$ =	6.81	6.81	6.81	Equation 30.5-1

Rafter Attachments: 0.6D+0.6W (CD=1.6)

Connection Check

Attachement max. spacing=	4 ft	
5/16" Lag Screw Withdrawal Value=	266 lbs/in	Table 12.2A - NDS
Lag Screw Penetration	2.5 in	DFL Assumed
Prying Coefficient	1.4	
Allowable Capacity=	760	

Zone	Trib Width	Area (ft)	0.6D+0.6W Uplift (lbs)	Dpv+0.6W Down (lbs)
1	4	11.0	120.0	107.9
2	4	11.0	177.2	107.9
3	3	8.3	218.0	80.9
		Max=	218.0	< 760

CONNECTION IS OK

1. Pv seismic dead weight is negligible to result in significant seismic uplift, therefore the wind uplift governs
2. Embedment is measured from the top of the framing member to the tapered tip of a lag screw. Embedment in sheathing or other material does not count.

Vertical Load Resisting System Design

Roof Framing

Rafters

$$\begin{aligned}
 P_g &= 40 \text{ psf} & \text{ASCE 7-10, Section 7.2} & & p_f &= 28 \text{ psf} \\
 C_e &= 0.9 & \text{ASCE 7-10, Table 7-2} & & p_{fmin.} &= 30.0 \text{ psf} \\
 C_t &= 1.1 & \text{ASCE 7-10, Table 7-3} & & p_s &= 30 \text{ psf} & 33.3 \text{ plf} \\
 I_s &= 1.0 & \text{ASCE 7-10, Table 1.5-1} & & C_s &= 0.833 \\
 \text{Max Length, } L &= 13 \text{ ft} \\
 \text{Tributary Width, } W_T &= 16 \text{ in} \\
 D_r &= 10 \text{ psf} & 13.33 \text{ plf} \\
 P_{vDL} &= 3 \text{ psf} & 4 \text{ plf}
 \end{aligned}$$

Load Case: DL+0.6W

$$\begin{aligned}
 P_{net} + P_{pv}\cos(\theta) + P_{DL} &= 26.4 \text{ plf} \\
 \text{Max Moment, } M_u &= 496 \text{ lb-ft} & \text{Conservatively} \\
 P_v \text{ max Shear} &= 107.9 \text{ lbs} \\
 \text{Max Shear, } V_u = W_L/2 + P_v \text{ Point Load} &= 221 \text{ lbs}
 \end{aligned}$$

Load Case: DL+0.75(0.6W+S)

$$\begin{aligned}
 0.75(P_{net} + P_s) + P_{pv}\cos(\theta) + P_{DL} &= 49 \text{ plf} \\
 M_{down} &= 918 \text{ lb-ft} \\
 \text{Mallowable} = S_x \times F_b' \text{ (wind)} &= 3608 \text{ lb-ft} > 918 \text{ lb-ft} \quad \text{OK}
 \end{aligned}$$

Load Case: DL+S

$$\begin{aligned}
 P_s + P_{pv}\cos(\theta) + P_{DL} &= 50 \text{ plf} \\
 M_{down} &= 947 \text{ lb-ft} \\
 \text{Mallowable} = S_x \times F_b' \text{ (wind)} &= 2593 \text{ lb-ft} > 947 \text{ lb-ft} \quad \text{OK}
 \end{aligned}$$

$$\text{Max Shear, } V_u = W_L/2 + P_v \text{ Point Load} = 328 \text{ lbs}$$

Member Capacity

DF-L No.1

2X10	Design Value	C_L	C_F	C_i	C_r	K_F	ϕ	λ	Adjusted Value
$F_b =$	1000 psi	1.0	1.1	1.0	1.15	2.54	0.85	0.8	1265 psi
$F_v =$	180 psi	N/A	N/A	1.0	N/A	2.88	0.75	0.8	180 psi
$E =$	1700000 psi	N/A	N/A	1.0	N/A	N/A	N/A	N/A	1700000 psi
$E_{min} =$	620000 psi	N/A	N/A	1.0	N/A	1.76	0.85	N/A	620000 psi

$$\begin{aligned}
 \text{Depth, } d &= 9.25 \text{ in} \\
 \text{Width, } b &= 1.5 \text{ in} \\
 \text{Cross-Sectional Area, } A &= 13.875 \text{ in}^2 \\
 \text{Moment of Inertia, } I_{xx} &= 98.9316 \text{ in}^4 \\
 \text{Section Modulus, } S_{xx} &= 21.3906 \text{ in}^3
 \end{aligned}$$

$$\text{Allowable Moment, } M_{all} = F_b' S_{xx} = 2254.9 \text{ lb-ft}$$

$$\text{Allowable Shear, } V_{all} = 2/3 F_v' A = 1665.0 \text{ lb}$$

$$\text{DCR} = M_u / M_{all} = 0.35 < 1$$

$$\text{DCR} = V_u / V_{all} = 0.20 < 1$$

Satisfactory

Satisfactory

Siesmic Loads Check

Roof Dead Load	10 psf
% or Roof with Pv	19%
Dpv and Racking	3 psf
Averarage Total Dead Load	10.6 psf
Increase in Dead Load	2.3% OK

The increase in seismic Dead weight as a result of the solar system is less than 10% of the existing structure and therefore no further seismic analysis is required.

Limits of Scope of Work and Liability

We have based our structural capacity determination on information in pictures and a drawing set titled PV plans -KEN KOKUBO. The analysis was according to applicable building codes, professional engineering and design experience, opinions and judgments. The calculations produced for this structure's assessment are only for the proposed solar panel installation referenced in the stamped plan set and were made according to generally recognized structural analysis standards and procedures.











27

194

192

188-190

188

188 Westminster Ave
Existing roof

Westminster Ave

Westminster Ave

Westminster Ave

Westminster Ave

Westminster Ave

Assessor
Map 86
Town of
Arlington, MA

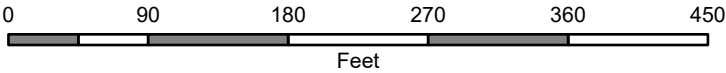
LEGEND

- Map Boundary
- Block Boundary
- Parcel Boundary
- 14-1-13 Map-Block-Lot
- 5,000 Lot Size (square feet)
- 100 Frontage (feet)
- Address
- Structure
- Minuteman Bikeway
- Stream / Brook
- Stream / Brook (culvert)
- Water Body

Assessor: arlingtonma.gov/assessor
GIS Office: arlingtonma.gov/maps



Assessor maps are compiled from aerial photography, existing surveys, deeds, and other plans; revisions are on-going. Maps are for planning purposes only and may not be adequate for legal boundary definition, regulatory interpretation, or property conveyance purposes. The Town of Arlington has made reasonable efforts to ensure accuracy of the content, but does not guarantee the accuracy of the information. Users are responsible for determining its suitability for their intended use or purpose. Map produced by Arlington GIS, 6/15/2021.





29



- Places by Category
- Police Station
 - Fire Station
 - School
 - Library
 - Public Works
- Tree - Inventory (for Base Map)
- Poles (For Base Maps - Highway)
- Traffic Signal Pole
 - Pedestrian Signal Pole
 - Street Light
- Parcels
- Buildings
- Recreation - Facilities
- Recreation - Fields Courts
- Recreation - Fields Courts
- Open Space: Conservation
- Open Space - Minuteman
- Open Space - Labels
- Open Space
- Town, State, or Private
 - Other Town Owned
- MA Highways
- Interstate
 - US Highway
 - Numbered Routes
- Abutting Towns
- Town Boundary
- Cemetery - Roads
- Road1
 - Road2
 - Road3
 - Road4
- Pavement Markings
- Impervious Surface - For Base Map
- Street
 - Sidewalk
 - Street Island
 - Driveway
 - Parking Lot
 - Bike Path
- Roads - For Large Scale (For Base Map)
- Roads - For Small Scale (For Base Map)
- Major Road
 - Local Road
- Master Plan Base Map - Master Plan
- Water Line
- Water Body

LEXINGTON

271

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Lowell St

Westminster Ave

Montague St

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0 67 134 ft

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Town of Arlington, MA